Table 5. Cotton percent lint at harvest as affected by tillage at Weslaco, Texas in 1997-1999.

Tillage system	1997	1998	1999
moldboard plow & disk	35.5 a	35.2 a	39.3 b
ridge tillage	35.5 a	35.9 a	39.4 b
no-tillage	34.1 a	36.5 a	39.7 ab

Comparisons are made within a column, numeric values followed by a common letter are not significantly different ($\alpha = 0.05$) as determined by a Waller-Duncan *k*-ratio *t*-test.

Table 6. Cotton lint yield in lbs/acre as affected by tillage at Weslaco, Texas in 1997-1999.

Tillage system	1997	1998	1999
moldboard plow & disk	689 a	466 a	916 b
ridge tillage	684 a	393 ab	831 c
no-tillage	629 a	330 b	1025 a

Comparisons are made within a column, numeric values followed by a common letter are not significantly different ($\alpha = 0.05$) as determined by a Waller-Duncan *k*-ratio *t*-test.

Table 7. Cotton harvest costs based on a custom pick and module cost of $21.67/cwt, gin, bag, ties $0.135/lb, and labor for a total costs of $0.38.17/lb total harvest costs.

Tillage system	1997	1998	1999
moldboard plow & disk	$242.32	$163.89	$322.16
ridge tillage	$240.56	$138.22	$292.26
no-tillage	$221.22	$116.06	$360.49

Table 8. Gross returns/acre based on $0.62/lb in 1997 and 1998 and $0.52/lb in 1999.

Tillage system	1997	1998	1999
moldboard plow & disk	$ 427	$ 289	$ 476
ridge tillage	$ 424	$ 244	$ 432
no-tillage	$ 390	$ 205	$ 533

Table 9. Net returns/acre as affected by tillage treatments based on $0.62/lb in 1997 and 1998 and $0.52/lb in 1999.

Tillage system	1997	1998	1999
moldboard plow & disk	$(-56)	$(-116)	$ (- 87)
ridge tillage	$ (- 8)	$ (- 86)	$ (- 52)
no-tillage	$ 8	$ (- 88)	$ 4)

COMPARISONS OF NO-TILLAGE AND CONVENTIONAL COTTON WITH EVALUATIONS OF MYCORRHIZAL ASSOCIATIONS

Ernest H. Flint, Jr.
Mississippi State University Extension Service
Glover B. Triplett
Mississippi Agricultural and Forestry Experiment Station
Seth M. Dabney
USDA-ARS National Sedimentation Laboratory

Abstract

Increased yield of cotton has been observed with no-tillage (NT) following winter wheat cover compared with conventional tillage (CT); however the reasons for NT benefits have remained unclear. The objectives of these studies were to document differences in plant growth between the two tillage systems, and to investigate possible interactions between vesicular-arbuscular mycorrhizal (VAM) fungi and cotton plant performance. Two primary questions were addressed. First, how much benefit is provided cotton by the NT system as compared with CT? Second, do VAM fungi contribute to increased growth of cotton?

Growth and maturity of cotton were influenced by tillage. Cotton plants fully emerged on May 12 were 25 percent taller and had developed 12 percent more nodes in NT soil than in CT soil by the final measurement date of July 6, 1996. Although there was no direct proof that VAM contributed to improvements in growth and maturation, observations were consistent with such a role. There was greater plant growth in NT soil as could be promoted by a VAM hyphal network, while other soil differences were likely involved. Plants in NT soil under field conditions continued rapid growth during an extended dry period. Growth of plants in CT soil was reduced even though NT plants had greater stomatal conductivity and transpiration rates. NT plants were better supplied with water than were CT plants even though water potential readings were similar for plants in the two tillage systems.

Plants had significantly more VAM colonization sites per centimeter of root in NT soil than in CT soil. Nylon mesh with 60 micron openings placed around roots contained greater numbers and length of VAM hyphae in NT soil than in CT soil when removed for inspection at the end of the study. Plants with root systems enclosed by the root-restricting nylon mesh absorbed more ^{32}P from placement sites outside the mesh in NT soil than in CT soil, an indication of hyphal absorption. Increased VAM activity resulting from NT culture was a positive factor contributing to rapid growth and maturation of NT cotton at this site.

COVER CROPS AND TILLAGE METHODS FOR UNR AND WIDE ROW COTTON

D. P. Delaney
Department of Agronomy & Soils
Auburn University, AL
D. W. Reeves
USDA-ARS National Soil Dynamics Laboratory
Auburn, AL
C. D. Monks
Department of Agronomy & Soils
Auburn University, AL
B. E. Gamble
Alabama Agricultural Experiment Station
Headland, AL

Abstract

Ultra Narrow Row (UNR) Cotton acreage has been rapidly increasing in Alabama in the last 3 - 4 years. Producers have become interested in UNR Cotton as a way to save on machinery costs and possibly increase yields on marginal land. Previous research in Alabama has shown increased yields with the use of conservation tillage and lupin/legumes as winter cover crops for UNR Cotton.

A study was begun at the Wiregrass Research and Education Center in southeastern AL in 1998 to investigate the optimum combination of row spacing (Wide vs UNR), cover crops (legume vs rye), and tillage (conventional vs no-till). This experiment has been conducted for 2 years on a Lucy loamy sand, normally a drought-prone and marginal soil for wide row cotton production.

Rye was planted as a cover crop during the fall of 1997 and 1998; lupin was planted in 1997 and a lupin/crimson clover mix was planted in 1998 due to

winter kill the previous year. Cover crops were killed at least one month before planting cotton and rolled down on no-till plots or incorporated on conventional. All plots were paratilled each spring.

Paymaster PM 1220 BG/RR cotton seed was planted in May of each year, but was replanted in June '98 due to extremely dry weather. UNR (8 inch rows) plots were planted at 182,000 seeds/A and Wide Row (36 inch) plots at 84,000 seeds/A each year. Best known management systems, including growth regulators, were used for each system. The 1998 growing season was characterized by an extremely dry spring, followed by a moderate summer. This is in contrast to 1999, when the spring and early summer was wet, followed by an extremely dry late summer.

Plant Populations counts showed that UNR had a higher population in 1998 than Wide row @ P=0.10 (148,000 vs 38,000 plants/A). In 1999, there was an interaction between Tillage and Row width, with populations of 37,000 plants/A for Wide row vs 139,000 for conventional UNR and 98,000 for no-till UNR.

Leaf Area Index (LAI) measurements showed a significant (P= 0.10) Row width * Cover * Tillage interaction with UNR cotton consistently having a higher LAI than Wide Row at Early Bloom. In 1999, there was a Tillage * Row Width interaction, again with UNR having a much higher LAI at this growth stage.

Lint yield measurements showed that UNR systems yielded higher (911 vs 596 lb/A) than wide row in 1998, with no interactions. In 1999, there was a Tillage * Cover interaction, but no Row Width effect. Conventional tilled plots after legumes yielded 949 lb/A vs 865 lb/A for no-till after legumes. After rye, conventional yielded 923 lb/A and no-till 669 lb/A. It appeared that early season leaching and slow breakdown of cover crops in late season may have caused nitrogen deficiency in no-till rye plots.

Based on two years of data, it appears that UNR cotton took advantage of higher early season intercepted sunlight (LAI) to yield better than Wide Row cotton in a year with a dry early summer that slowed late season growth. In a year with a wet early spring and dry late summer, Wide Row cotton continued growth through late bloom and yielded the same as UNR. In that year, no-tilling decreased yields, while cover crops had a variable effect.

FARMING SYSTEMS FOR ULTRA-NARROW ROW COTTON

D. W. Reeves
USDA-ARS National Soil Dynamics Laboratory
Auburn, AL
D. P. Delaney
Auburn University Cooperative Extension Service
R. M. Durbin
Alabama Agricultural Experiment Station
Auburn University
Auburn, AL

Extended Abstract

Crop rotations are agronomically beneficial. Intensive cropping systems, using high-residue crops in rotations and coupled with conservation tillage, can dramatically improve soil quality and productivity. Unfortunately, economic reality often dictates cotton (*Gossypium hirsutum* L.) monoculture instead of rotations.

Recent research has shown that planting cotton with a grain drill in ultra-narrow rows (UNR) is a very promising production system. Other research at Auburn has shown that the tropical legume, sunn hemp (*Crotalaria juncea* L.), can be planted after corn (*Zea mays* L.) harvest and make 4000 lb/A residue and 120 lb N/A before the first killing frost. This N is readily available during the winter season and should be sufficient for a winter wheat (*Triticum aestivum* L.) crop. Sunn hemp has also been reported to suppress root-knot (*Meloidogyne spp.*) and reniform (*Rotylenchulus reniformis*) nematodes.

We established a study to compare an intensive cropping system, maximizing the production of crop residues and legume N inputs, to standard cotton production systems used in the Southeast. The maximization of crop residue production and use of legumes should improve soil quality and increase productivity in a relatively short time. The new system uses research results from sunn hemp and ultra-narrow row cotton in an intensive rotation with wheat and corn. The standard systems use continuous cotton (both standard 40-inch rows and ultra-narrow row) and a corn - cotton rotation. All systems are tested under conservation and conventional tillage. The specific objectives of the research are to: 1) develop a cotton production system that maximizes soil carbon inputs; 2) determine the impact of the system on soil quality and productivity; and 3) determine the most economically favorable cropping system compared to standard cotton production systems.

This experiment was initiated in August of 1997 with the planting of sunn hemp on a Compass sandy loam (coarse-loamy, siliceous, subactive, thermic Plinthic Paleudults) in east-central AL. The site had previously been a tillage study with a corn-soybean [*Glycine max* (L.) Merr.] rotation and a winter cover crop of crimson clover (*Trifolium incarnatum* L.) for the past 10 years. The previous study had conservation (no-tillage; with and without in-row subsoiling) and conventional (disk-chisel-disk-field cultivate; with and without in-row subsoiling) tillage variables. Prior to starting this cotton study, the entire area was non-inversion deep-tilled with a paratill.

Tillage treatments in the cotton systems study were arranged to maintain the integrity of the previous 10-years conservation and conventional tillage treatments. The experiment design was a split plot arrangement of treatments in a randomized complete block of four replications. Main plots were cropping systems and subplots were tillage, i.e., the previous conventional and conservation tillage treatments maintained. Cropping systems were: 1) intensive system; 2) cotton-corn rotation with 40-inch rows; 3) continuous cotton with 40-inch rows; and 4) continuous ultra-narrow (8-inch drill) cotton.

The intensive system maintains actively growing cash or cover crops about 360 days of the year. Corn is planted in early April and harvested in August; followed immediately by sunn hemp, which is terminated in early November when wheat is drilled. Ultra-narrow row cotton is drilled following wheat harvest in early to mid-June. Following cotton harvest in October, a white lupin (*Lupinus albus* L.)-crimson clover mixed cover crop is drilled for use by the following corn crop that starts another rotation cycle. In the continuous and corn-cotton rotation treatments, a black oat (*Avena strigosa* Schreb.) - rye (*Secale cereale* L.) cover crop mix is used prior to cotton and the white lupin-crimson clover cover crop is used prior to corn. All phases of each rotation are present each year in all cropping systems, to eliminate confounding year effects with system effects.

Paymaster 1330 BG/RR was planted at 50,000 seed/A for 40-inch cotton and drilled at 170,000 seed/A for ultra-narrow row cotton. Planting dates for 40-inch cotton and continuous ultra-narrow row cotton were May 11, 1998 and May 13, 1999. Planting dates for ultra-narrow row cotton in the intensive system were June 4, 1998 and June 18, 1999. All cover crops were killed 14-21 days prior to planting using glyphosate and a mechanical roller. Weeds were controlled with glyphosate over-the-top at 4-true leaves; in 1999 preemergence applications of fluometuron and pendimethalin were also applied. Nitrogen (120 lb N/A) was broadcast